NAVAL INTERESTS IN ADVANCED DIESEL TECHNOLOGY

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The high speed diesel engine is the preferred primemover for a wide variety of military Naval and land applications. Its high fuel efficiency, low cost and high reliability make it an attractive choice. Traditionally, diesel engines have been made from predominantly ferrous materials because of the severe performance and durability demands of the commercial markets in which they are used. The large volume of ferrous components on the engine means that the engine is relatively heavy and has a high magnetic signature. There are military applications, such as high speed patrol craft, minesweepers, and amphibious vehicles, where reductions in engine weight, magnetic signature and noise would greatly enhance its effectiveness as a primemover. Currently, lightweight and/or nonmagnetic diesel engines used by the Navy are highly specialized, expensive and are usually manufactured in a foreign country. The Navy/DOE and engine manufacturers are mutually interested in the development of a commercial line of heavy duty and medium duty diesel engines which are considerably lighter in weight and are quieter, but with no sacrifice in performance or durability and with only a marginal increase in cost compared to present engines. Since achieving weight reduction involves replacing components made of ferrous materials with those made from predominantly nonferrous materials, these engines will have a significantly reduced magnetic signature for naval applications. The scope of the Navy effort includes vibration and magnetic signature modeling, materials evaluation, and full scale engine demonstrations. Material candidates include metal and ceramic matrices and polymerics, for engine structural and reciprocating components, along with various non-structural covers and housings.

The Navy is required to comply with Federal, state and local air pollution requirements. The Environmental Protection Agency (EPA), the California Air Resources Board (CARB) and the International Maritime Organization (IMO) have all proposed NO_x limits on marine engine emissions which would be very stringent for Navy ships. Virtually all Navy diesel engines exceed the limits, some by more than a factor of two. By requiring these levels within a specified distance of the coast, Navy operations and mission would be significantly affected. It is possible that the Navy will be required to bring some portion of its engine population into compliance after 1999. A logical target for an initial effort would be the large number of diesel engines of less than 400 hp which are operated primarily in harbor and coastal waters. Any NOx control system for these ships must be retofitable, and must minimize performance effects, operational complexity, cost, and space and weight requirements. Working in conjunction with a Navy engine manufacturer, a compact SCR system will be evaluated and NOx levels consistent with anticipated regulations will be demonstrated.